FactoryPhysics®

Know the Laws. Use the Tools. Profit.

www.factoryphysics.com

An Overview

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Background

Factory Physics Inc. provides consulting, software and training enabling managers to improve profitability in several ways:

1. Determine if your strategy and goals are achievable given the resources you have available.
2. Decrease cost by increasing the output of your process without large capital expenditures or increases in labor cost.
3. Improve on-time delivery performance by optimizing Finished Goods inventory policy.
4. Increase responsiveness by reducing cycle times and improving on-time delivery.
5. Implement a scientific, comprehensive framework to enable you to completely control and optimize your processes through practical application of Factory Physics® principles.

The Problem

Companies are looking for an approach that can unite existing disparate efforts, such as Lean Manufacturing, Six Sigma or Supply Chain Management, into a single framework to:

1. Simply and practically show what methods work, why they work, and when they do not work.
2. Provide substantial increases in profitability through improved control and optimization tools and techniques that are easily customized for a company's unique environment.
3. Use data found in IT systems, such as ERP, that now pervade the corporate landscape.
4. Interface and work with a company's existing IT systems.

The Solution

Through years of research and development in cooperation with industry and with researchers at Northwestern University, Georgia Tech and the University of Leuven, the Factory Physics® paradigm has been developed to provide a practical, scientific framework that describes the fundamental operations of any manufacturing or logistical process. Factory Physics® is the title of both an award winning book and of our company. Since 2001, Factory Physics Inc. has implemented dramatic improvements in performance at leading companies around the world.

Factory Physics principles alone are not a solution—only knowledge of how to reach a solution. There are other components needed to create and **implement performance improvements**. In order for this new paradigm to be effective in improving processes, Factory Physics Inc. provides the following supporting products:

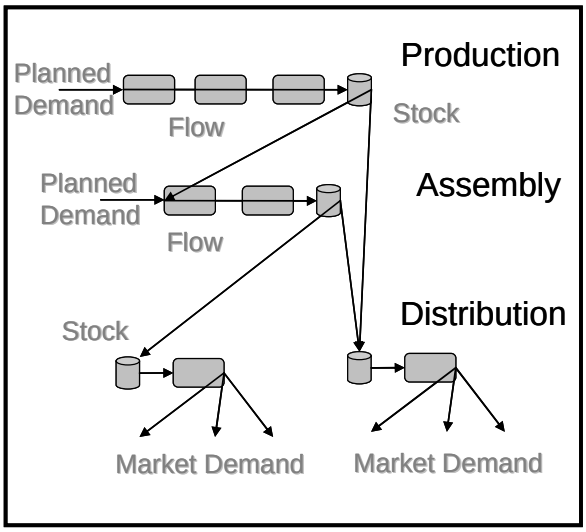
1. **A Factory Physics training program** that improves the *intuition* of operations process managers. Better intuition leads to better decisions, more creative problem solving and increased profitability.
2. **Methods** and **Software** based on Factory Physics® principles that enable executives to improve the **design** of their operations. Intuition is not enough when it comes to designing a new system or to improving an existing one.
3. **Procedures** and **Software** based on Factory Physics® principles that improve operations **planning**.
4. **Lean Manufacturing** and **Six Sigma** tools and techniques for improving operations. Many companies already have these tools available. Factory Physics Inc. has provided millions of dollars of increased profitability to companies that have been using Lean Manufacturing and Six Sigma for years.

5. **Controls** and **Software** based on Factory Physics® principles that improve operations **execution**. Factory Physics Inc. software (see www.leanphysics.com) integrates with the *information* contained in the IT system and provides straightforward visual controls.

Factory Physics Inc. provides any or all of the above products for its clients depending on the client's unique requirements.

Your Company

In simplest terms, your company can be described as a series of stocks and flows that make up your Value Stream:



Demand is an inflow to your value stream and transformation (or production) is an outflow. Value stream performance depends on how well demand is aligned with transformation and the amount of variability present.

If Demand is not perfectly aligned with Transformation or if variability is present (and variability is always present), *buffers* appear. Notice we did not say buffers might appear or buffers should appear or it'd be nice if buffers appear. Buffers *will* appear and there are only three types of buffers:

- Inventory
- Time
- Capacity

Factory Physics Inc.'s framework and products provide managers the training and tools to understand the most profitable tradeoffs between process and product variability levels and overall buffer cost to make the decisions that are most suitable for a manager's unique environments.

The following is a central concept to the comprehensive and practical Factory Physics approach:

1) If you do Design well, Planning is easier.

2) If you do Planning well, Execution is easier.

Too often companies start at the Execution phase with Design and Planning of operations logistics being addressed only as secondary considerations. As you will see below, Factory Physics Inc. provides techniques and software for understanding and improving the design and planning of operations logistics as well as for best possible control of execution.

Your Company's Performance

Understanding Current Performance and Opportunities

Determining your company's performance improvement opportunities has never been a straightforward task—until now.

As an executive manager, or any kind of manager, the ultimate goal for your company is always to make money now and in the future—if you don't meet that goal over the long term, you'll be looking for another job at another company. Creating and implementing operations strategies to meet the goal is a matter of **selecting and implementing the best operations logistics design for your business environment**—not for Toyota's or GE's business environment, unless they are your competitors. (Note: When we refer to operations logistics, we mean implementation and control of manufacturing and service capacity, inventory and responsiveness for a given market's variability—we are not talking about the more common use of logistics in referring solely to distribution and transportation of goods.) Operations logistics design is a matter of determining and implementing the optimal portfolio of buffers and variability to enable your company to achieve its marketing and financial goals.

Factory Physics Inc. provides **Absolute Benchmarking** tools and techniques to help managers gain a more powerful understanding of their operations. In keeping with the structure described in the section on Your Company, Absolute Benchmarking can be performed on Stocks or Flows.

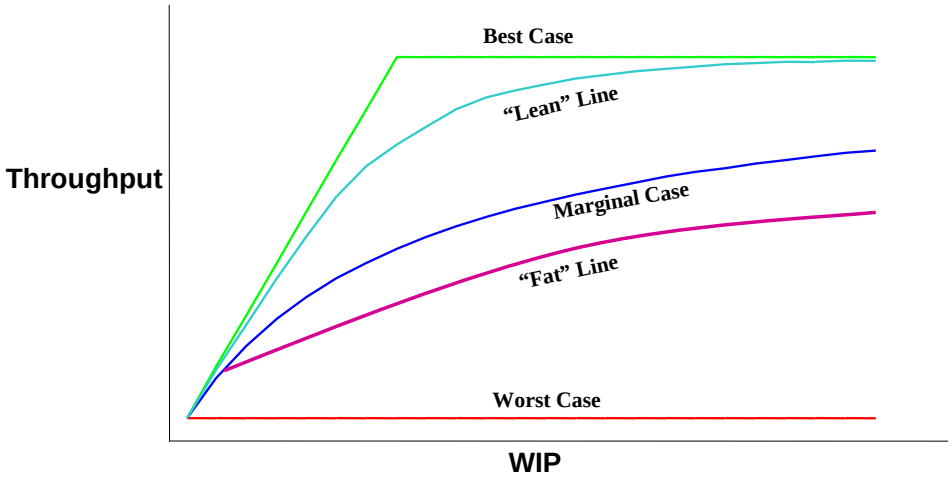
For looking at Value Stream flows, a manager can use **Flow Benchmarking** and, on one graph, understand how close actual performance is to best possible performance for a given environment

- "Best Possible" for flows means maximum throughput with minimum cycle time.

Once that is understood, further work will provide answers to the following:

1. What are the most productive approaches to take to improve performance to best possible?
2. What are the opportunities for improving best possible performance?

The Flow Benchmarking plot below shows Throughput versus WIP for a value stream. The various lines represent different levels of performance for a value stream ranging from Worst Case to Best Case. These are extremely powerful curves for improving a manager's understanding of an operation and potential improvement opportunities.



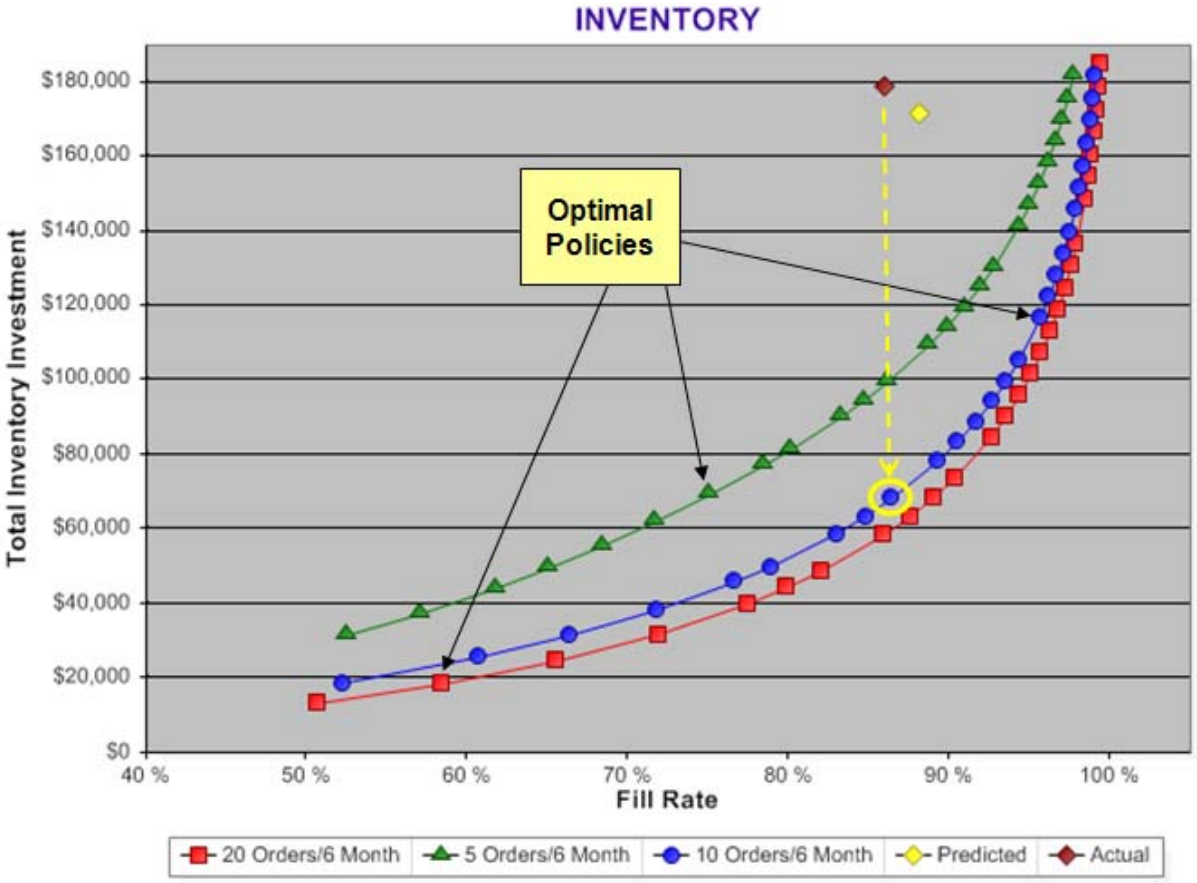
In most cases, performance evaluation is incomplete without determining how well Finished Good Inventory levels are set and maintained. After all, inventory is just cash waiting to be freed.

Optimizing Inventory Levels

Finished Goods Inventory (FGI) is a buffer to which most companies' executive managers pay keen attention. Until now, most companies have had poor options for understanding how to set optimal inventory levels. Factory Physics Inc. has developed fundamentals of inventory theory into the simple and effective method of Absolute Benchmarking for Stocks using the **Stock Optimizer**.

The result is a revolutionary application that allows managers to make two simple choices:

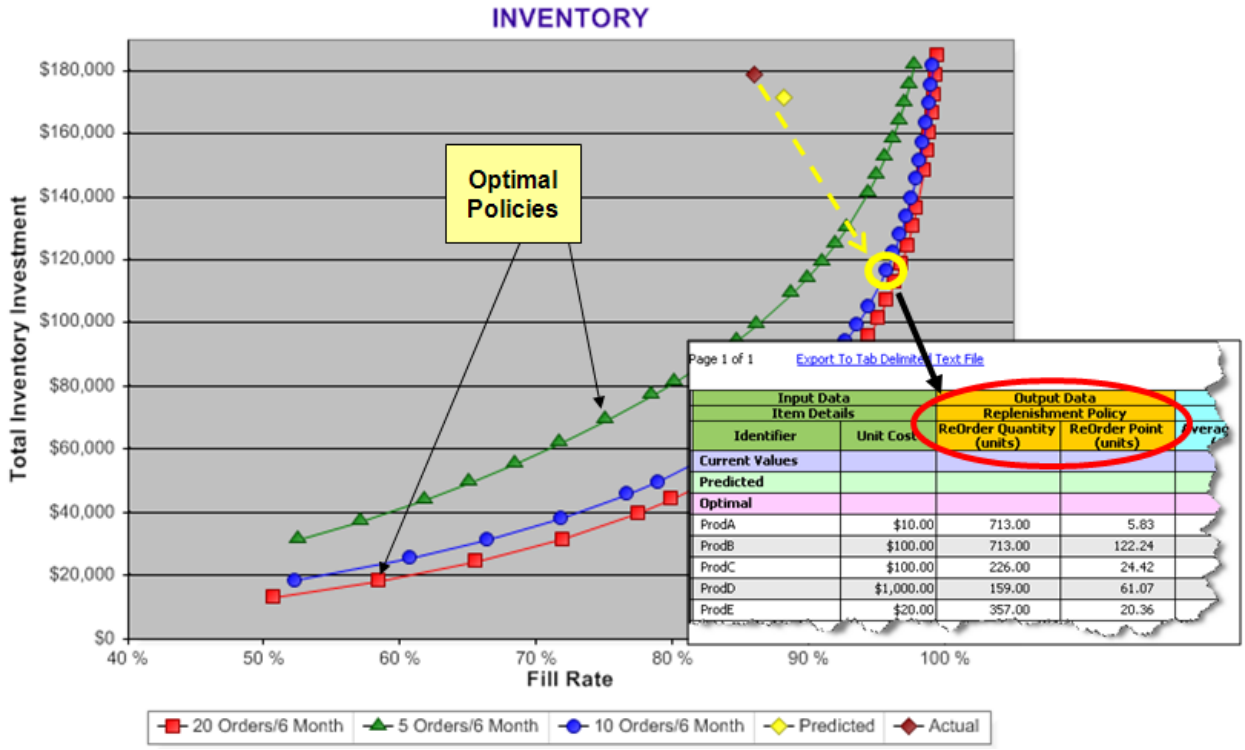
1) How much inventory the manager wants to hold, and
2) What level of service the manager deems is acceptable for customers



Note that in the example graph above, the brown diamond represents actual performance. What this graph shows is that this company can reduce inventory well over 50% while maintaining the same service level by selecting the point on the blue curve directly below the brown diamond. (The point in the yellow circle.) For informational purposes, the yellow diamond is the inventory cost and performance that would be achieved using the company's current policies.

Alternatively, the company could improve service levels to near 100% by selecting a point on the blue, green or red curves directly to the right of the brown diamond. The Stock Optimizer doesn't tell a manager what the manager should do, the Stock Optimizer gives a manager information about what will happen depending on what the manager decides to do. In the example below, the manager chooses a policy that provides a 30% reduction in inventory with fill rate increasing to nearly 98%.

The inlay table on the chart below shows how selecting one point on the graph generates optimal policy for all parts in the stock point, this could be from one item to thousands of items. This data can be exported for analysis or exported through web services directly to your ERP system.



Ensuring Execution

Current popular initiatives emphasize execution based on the assembly line model—make sure that the line speed or, alternatively, the tact time, is set to meet demand. What if your process is not an assembly line? You can spend extensive efforts trying to get the process to perform like an assembly line or you can use Factory Physics Inc.'s powerful Dynamic Risk-based Scheduling (DRS). DRS is mission critical software that you would use to run your plant day-to-day.

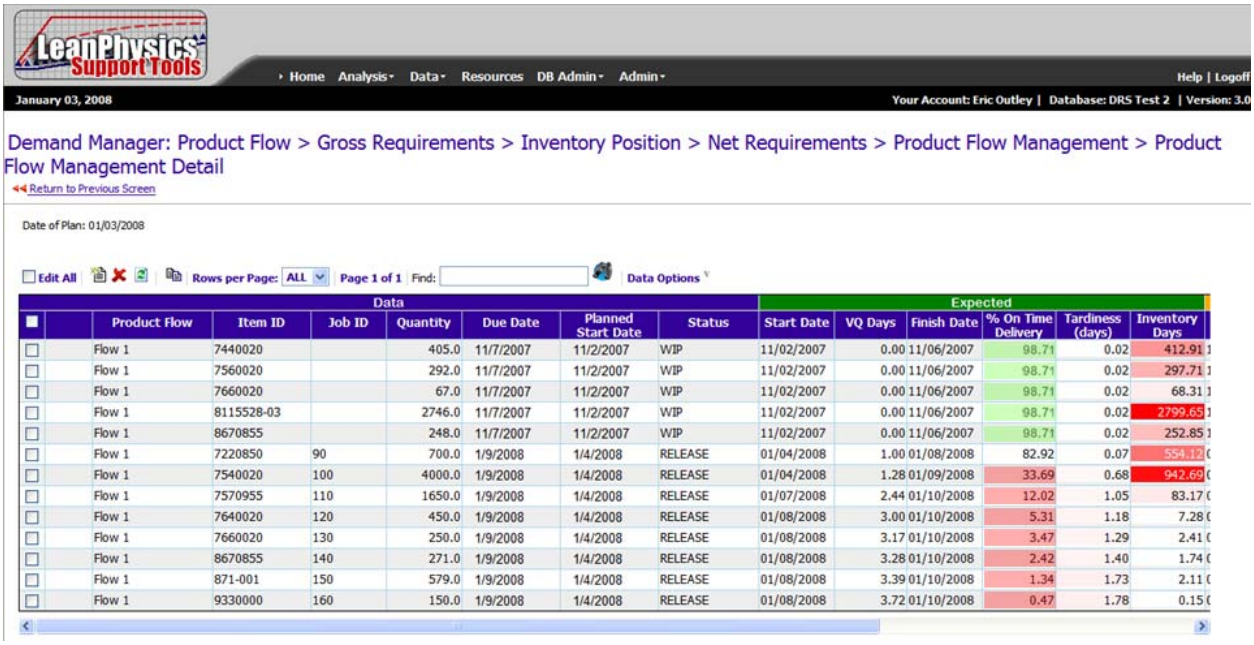
Ever been at a company where an expensive IT package has been installed and then planners and managers use EXCEL spreadsheets to manage the plant day to day? This is strong evidence of the flaws inherent in most software systems that do not take into account the natural behavior of supply chains as described by the practical science of Factory Physics principles. DRS is a proprietary technology developed by Factory Physics Inc. to provide managers and planners a simple yet sophisticated tool for managing day to day operations.

DRS does not replace existing ERP systems. It is a bolt-on application that is used to manage production. DRS software is not required for the application of Factory Physics principles, DRS is software that enables standardization and simplification of best possible performance using Factory Physics principles.

Predictive Control

Detailed scheduling (what item at what machine at what time) is a losing proposition. Numerical complexity makes optimal detailed scheduling an impossibility in all but the most simple production environments. Yet, that has been the paradigm used by most IT systems since the advent of the computer. Factory Physics Inc.'s DRS breaks the old paradigm and provides predictive scheduling by addressing the underlying science of operations logistics. DRS works *with* the natural behavior of your supply chain, not against it. As a manager, how many times have you had

people come to you and tell you why something went wrong *after* it went wrong. More preferable is a predictive ability to determine what will happen before things go wrong—this predictive ability is provided with DRS.



Data								Expected					
	Product Flow	Item ID	Job ID	Quantity	Due Date	Planned Start Date	Status	Start Date	VQ Days	Finish Date	% On Time Delivery	Tardiness (days)	Inventory Days
	Flow 1	7440020		405.0	11/7/2007	11/2/2007	WIP	11/02/2007	0.00	11/06/2007	98.71	0.02	412.91
	Flow 1	7560020		292.0	11/7/2007	11/2/2007	WIP	11/02/2007	0.00	11/06/2007	98.71	0.02	297.71
	Flow 1	7660020		67.0	11/7/2007	11/2/2007	WIP	11/02/2007	0.00	11/06/2007	98.71	0.02	68.31
	Flow 1	8115528-03		2746.0	11/7/2007	11/2/2007	WIP	11/02/2007	0.00	11/06/2007	98.71	0.02	2799.65
	Flow 1	8670855		248.0	11/7/2007	11/2/2007	WIP	11/02/2007	0.00	11/06/2007	98.71	0.02	252.85
	Flow 1	7220850	90	700.0	1/9/2008	1/4/2008	RELEASE	01/04/2008	1.00	01/08/2008	82.92	0.07	554.17
	Flow 1	7540020	100	4000.0	1/9/2008	1/4/2008	RELEASE	01/04/2008	1.28	01/09/2008	33.69	0.68	942.69
	Flow 1	7570955	110	1650.0	1/9/2008	1/4/2008	RELEASE	01/07/2008	2.44	01/10/2008	12.02	1.05	83.17
	Flow 1	7640020	120	450.0	1/9/2008	1/4/2008	RELEASE	01/08/2008	3.00	01/10/2008	5.31	1.18	7.28
	Flow 1	7660020	130	250.0	1/9/2008	1/4/2008	RELEASE	01/08/2008	3.17	01/10/2008	3.47	1.29	2.41
	Flow 1	8670855	140	271.0	1/9/2008	1/4/2008	RELEASE	01/08/2008	3.28	01/10/2008	2.42	1.40	1.74
	Flow 1	871-001	150	579.0	1/9/2008	1/4/2008	RELEASE	01/08/2008	3.39	01/10/2008	1.34	1.73	2.11
	Flow 1	9330000	160	150.0	1/9/2008	1/4/2008	RELEASE	01/08/2008	3.72	01/10/2008	0.47	1.78	0.15

The screen shot of the DRS Flow Management module enables planners to understand expected performance of work orders in terms of on-time delivery and inventory investment. Planners can use their experience and knowledge to dynamically assess the risk of missing shipments. This dynamic capability enables best possible system planning and control as it takes into account the stochastic nature of operations logistics.

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